

Jan Fidrmuc and Juan D. Tena Minimum Wage and Young Workers: UK Evidence¹

INTRODUCTION

The minimum wage is a popular, if controversial, tool of economic policy making and for regulating the labour markets.² On the one hand, it is seen as delivering a number of positive effects: it prevents the exploitation of marginal and vulnerable workers, reduces poverty and inequality, raises the standard of living of poorly-paid workers, and increases the labour supply. However, the minimum wage also has the potential to hurt those that it was intended to protect by increasing the cost of labour, reducing demand for labour, and even making the least productive workers unemployable. With ever progressing globalisation and digitalisation of production, poorly-paid workers' jobs can often be easily offshored or replaced by a clever machine or an app.

The UK introduced a national minimum wage in April 1999. After its introduction, its employment effects were analysed by a number of studies. Stewart (2004) and Dickens and Draca (2005) consider the effect of the minimum wage introduction and the annual increases, respectively. Dolton, Rosazza-Bondibene and Wadsworth (2009) draw on the fact that, unlike the minimum wage rates, average earnings vary considerably across the regions of the UK. They use the resulting variation in the 'bite' of the minimum wage at the regional level to assess its impact on employment. These studies find little evidence that the UK minimum wage has had an adverse effect on employment. The main (and probably only) exception so far is Dickens, Riley and Wilkinson (2015) who present evidence that the introduction, and annual minimum wage increases, reduce the employment of part-time women, a segment of the labour market that is especially exposed to the minimum wage.

To gauge the effects of a policy, one should look at those who are most likely to be affected by it. In the UK, as in many other developed countries, the incidence of the minimum wage is much higher among young and

part-time workers. The young are also more likely to be employed part-time.³ Since its introduction in 1999, UK minimum wage regulation has mandated lower rates for young workers: at present, different minimum-wage rates apply to workers aged 25 and above, 21–24, 18–20, and below 18.⁴ This helps to ensure that young workers, who tend to be less productive than older and more experienced workers, are not disadvantaged in the labour market. However, it also implies that the cost of employing young workers at the minimum wage jumps by a discrete increment when they reach the threshold age. In particular, upon turning 22 (21 from 2010 onwards), young workers on minimum wage become eligible to a pay increase of 20–25%. This is a much larger increase than any of the annual minimum-wage increases. Moreover, employers can easily replace such workers with slightly younger, and cheaper, workers who are still below the relevant age threshold. So if we want to understand how increases in the minimum wage affect employment, it is instructive to look at young workers, a segment of the labour market where the incidence of the minimum wage is high and where workers are subject to relatively large minimum-wage increases.

EMPLOYMENT EFFECTS OF AGE RELATED MINIMUM WAGE INCREASES

In our research, we consider UK young workers aged between 18 and the age that makes them eligible for the adult rate of the national minimum wage. Such workers are considered adults in the UK: they can drive (if they have a driver's license), handle and sell age-restricted goods such as tobacco and alcohol, and work late or long hours. As such, they can be considered substitutes for slightly older workers, except that the latter may be slightly more experienced. Therefore, individuals just below and just above the age threshold should, arguably, be essentially perfect substitutes in terms of their productivity and experience – yet they are subject to different minimum-wage rates.

Our main analysis uses the regression discontinuity design (RDD). This quasi-experimental method is based on comparing observations on either side of a discontinuity: in our case the age threshold for the adult minimum-wage rate. If observations on either side of the discontinuity differ only with respect to the forcing variable (age), but are otherwise similar, the differences between them are as good as random. Importantly, the discontinuity effect can be manifested either in a level change (a step increase or decrease in employment probability), or in a kink in the underlying functional relationship (a slope change in the relationship



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² The vast majority of OECD countries impose some form of a minimum wage, either determined centrally by the government (whether national or local), or through collective bargaining between employers and unions, with the outcome being binding also for non-unionized firms (see Dolado et al. 1996, and Dolton and Rosazza-Bondibene 2012).

³ See Section 9 and Figures 8a and 8b in Syed et al. (2016).

⁴ In 1999, when the UK National Minimum Wage was introduced, it featured two rates: an adult rate for those aged 22 and above, and a development rate for those between 18 and 21. A third rate, for workers aged 16–17, was introduced in 2004. The age threshold for the adult rate was lowered to 21 in 2010. Finally, a National Living Wage, applying to anyone aged 25 and above, was implemented in 2016.

between employment and age).⁵ We thus estimate the following relation:

$$E[y_i|age_i, d] = F(\theta + \alpha_0 * age_i * (1 - d) + \alpha_1 * age_i^2 * (1 - d) + \alpha_0^* * age_i * d + \alpha_1^* * age_i^2 * d + \beta * d) = F(u)$$

(1)

where y_i is equal to one if the individual is employed (or, alternatively, unemployed or inactive), F is the standard normal cumulative distribution function, age_i is age in months minus the threshold age (so that the threshold age equals 0), d is a dummy variable equal to one when the individual is at the threshold age or older and zero otherwise, and θ includes any remaining covariates. We allow for the effect of age to be different before and after the young workers attain the threshold age. It is worth noting that F is a non-linear function (probit). The discontinuity effect on employment thus becomes:

$$\frac{\Delta \frac{\Delta F(.)}{\Delta age}}{\Delta d} = \frac{F(\theta + \beta) - F(\theta - \alpha_0^* + \alpha_1^* + \beta) - F(\theta) + F(\theta - \alpha_0 + \alpha_1)}{(2)}$$

It is also worth noting that the effect of discontinuity on employment probability depends not only on the coefficient of the discontinuity dummy, β , but also on the changes in the slope coefficients of age: α_0 , α_1 , α_0^* , and α_1^* .

The analysis is carried out with the UK Labour Force Survey (LFS), a quarterly nationally-representative survey of UK households of approximately 60,000 households and over 100,000 individuals aged 16 and above in each quarterly survey. The survey contains detailed demographic and socio-economic information on the respondents, including their labour-market outcomes, and the exact date of birth of every respondent.⁶ The date of birth, together with the information on when the survey was carried out, allows us to deter-

⁵ See Card et al. (2012), Dong (2014), and Nielsen et al. (2010) for further details.
⁶ This information is not available in the publicly released LFS datasets. We are grateful to the Low Pay Commission and the Office for National Statistics for helping us obtain access to the restricted release of the LFS.

Table 1

Discontinuity Effect on Employment at 21, 22 and 23 years, 1999–2009

	21 years		22 years		23 years	
	Males	Females	Males	Females	Males	Females
Discontinuity (1)	-.00994 (.00326)**	-.001039 (.00349)	-.00228 (.00331)	.00368 (.00353)	.00435 (.00318)	-.00179 (.00336)
β (2)	-.00764 (.01150)	-.00186 (.01184)	.00567 (.01097)	.00589 (.01154)	.01043 (.01023)	-.01325 (.01138)
No. observations	68,324	70,647	66,582	70,009	65,206	70,622
χ^2	17001.14	12155.02	15412.56	12942.46	13443.49	14310.83
$Pr > \chi^2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R ²	0.1947	0.11285	0.1918	0.1411	0.1879	0.1602

Note: All estimations include covariates. (1) estimated discontinuity effect taking into account the combined impact of age (slope effect) and the threshold dummy variable (level effect). (2) estimated impact of the threshold dummy variable only. Coefficients reported are marginal effects at mean values, with standard deviations in parentheses. Significance levels denoted as * 5% and ** 1%.
Source: Labour Force Survey (1999–2009).

mine the exact age of each respondent at the time of the survey. Therefore, we can distinguish the young workers on either side of the age threshold. This threshold was 22 years until October 2010, when it was lowered to 21. To avoid potentially contaminating our results by considering two different age thresholds, we only use data from the 2nd quarter (April-June) of 1999 until the last quarter (October-December) of 2009. Our analysis uses all workers whose ages lie within ± 15 months around the age threshold: the threshold age is thus 264 months and we consider workers aged between 249 and 279 months.

An important assumption behind the RDD approach is that the discontinuity is applied in a manner that is as good as random. Examples include points thresholds for awarding scholarships, externally imposed border changes, or the difference in a competition between the winner and the runner-up. In the case of minimum-wage rates, however, the threshold age is known beforehand by both employees (actual or potential) and employers. Both can already act in advance of the workers reaching the threshold age. For instance, if an employer has an incentive to avoid employing a 22-years-old worker, they may similarly wish to avoid employing one aged 21 and half or 21. Likewise, a worker whose reservation wage is below the 18-21 minimum-wage rate may nevertheless take up employment when aged 20 or 21 in anticipation of the statutorily mandated pay increase when turning 22. Another possibility is that either employer or employee takes action only with a delay, well after reaching the threshold age. Therefore, besides looking at the threshold effect at 22 years of age, we also consider 21 and 23 years.

The results are summarised in Table 1. It is worth noting that we report both the full discontinuity effect as given by equation (2) above, and the level effect, given by the coefficient estimate of β . We find no discontinuity effect on the employment probability when turning 22, the age when young workers become eligi-

Table 2

Discontinuity Effect on Employment at 21, 22 and 23 years in the Pre-NMW period, 1994–98

	21 years		22 years		23 years	
	Males	Females	Males	Females	Males	Females
Discontinuity (1)	-0.004 (0.0181)	-0.0056 (0.0183)	0.00528 (0.017)	0.0175 (0.018)	0.0144 (0.0156)	0.0072 (0.005)
β (2)	0.00804 (0.0055)	-0.0097 (0.0053)	-0.0008 (0.005)	0.00205 (0.0053)	-0.0047 (0.0045)	-0.0036 (0.0166)
No. observations	29,872	30,550	30,606	32,265	31,839	34,538
χ^2	7964.52	5768.08	7556.75	6809.31	6873.88	7512.05
$Pr > \chi^2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R ²	0.2052	0.1396	0.1994	0.1592	0.1877	0.1698

Note: All estimations include covariates. (1) estimated discontinuity effect taking into account the combined impact of age (slope effect) and the threshold dummy variable (level effect). (2) estimated impact of the threshold dummy variable only. Coefficients reported are marginal effects at mean values, with standard deviations in parentheses. Significance levels denoted as * 5% and ** 1%.
Source: Labour Force Survey (1999–2009).

ble for the adult minimum-wage rate, for either males or females. However, we find a significantly negative effect one year earlier, for male workers turning 21. The effect of turning 23, one year after the relevant threshold, is again insignificant for both genders.

Finding a negative effect at the age of 21, one year before the higher minimum-wage rate has to be applied, could be explained as an anticipation effect, whereby employers either avoid hiring or dismiss, workers who are within one year of the age threshold. An alternative explanation, however, is that it is driven by the productivity difference between workers aged 21 and 22. To test the latter explanation, we turn to data that pre-date the minimum-wage introduction in the UK. Table 2 reports the estimates for the period 1994-99, which are all insignificant. Hence, the negative employment effect for males aged 21 only occurs in the period when the minimum-wage regulation was in effect.

CONCLUSIONS

The results of our analysis suggest that young workers face a lower probability of employment as they are approaching the threshold age at which they become eligible for the higher adult rate of the minimum wage. The effect, however, does not occur at the age when they become eligible for the higher rate. Instead, it takes place one year earlier, in a manner that is consistent with employers acting in anticipation of the age-related minimum wage increase. This reflects the nature of the issue at hand: age-related minimum-wage increases take place at predetermined ages in a deterministic, rather than a random fashion. Therefore, employers can act well in advance of the minimum-wage increase. Another possibility is that workers approaching 22, knowing that soon they will be eligible for a higher minimum-wage rate, increase their reservation wage before reaching the threshold wage.

These results have two important implications: one policy-related, and the other methodological. The

policy-related lesson is that well-meant policy measures, such as implementing a lower minimum-wage rate for young workers, can have unexpected adverse effects by inducing employers to discriminate against workers who are no longer eligible for the reduced rate. This incentive is particularly compelling if the pay difference is relatively large, as in the UK case (20-25%).⁷

The methodological lesson, in turn, is that when considering age-related discontinuities (and other deterministic rather than random allocation mechanisms), the effect need not take place at the threshold age. Since the age at which the discontinuity occurs is predetermined, it is possible to see anticipation effects, such as the one we observe for the minimum wage effect.

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⁷ However, Kabatek (2015) presents evidence of a negative employment effect of the Dutch minimum wage for young workers, which increases marginally with each year of age. Kabatek finds that workers face a lower employment probability around the time of their birthdays as a result.

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